B.C.Hydro

Electric Load Forecast

1986/87 - 1996/97

Low-Probable-High

Prepared by
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FOREWORD

The 1986 electric forecast was completed and presented to management in mid-year. It was not finalized pending the completion of a corporate marketing plan which was designed to address programs to increase domestic sales of surplus electricity.

At the time the major part of the electric forecast was prepared no significant residential and commercial marketing efforts were anticipated. Programs for industrial sales were under way, and are included and detailed in the main body of this document.

The corporate marketing plan envisages both an expanded industrial sales program and marketing to a wider range of customers. One major thrust is to develop an interruptible electricity market domestically. These additional programs are dealt with in APPENDIX A with a table provided to show the impact on the forecasted sales requirements. Next year's planning cycle foresees the corporate marketing plan being developed earlier and thus will be fully integrated into the forecast.

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1.0 SUMMARY

This document presents B. C. Hydro's forecasts of electric sales and resulting gross requirements to 1996/97. The forecast document is prepared annually as a basis for fixed asset expenditure planning and financial planning.

The past year saw an increase in electric sales to all customer categories, including domestic marketing programs, of 5.3% growth in total. Without inclusion of domestic marketing programs, growth was 3.5%. An update of 1986/87 was prepared in January of 1986 (to reflect mainly increased projected marketing program sales) to revise the revenue budget for 1986/87.

A summary of this year's probable major economic assumptions shows:

ECONOMIC ASSUMPTIONS - 1986

B. C. Gross Domestic Product (GDP) Growth Rate, 1985 to 1996	3.3% per year
B. C. Population Growth Rate, 1985 to 1996	1.3% per year

The resultant probable load forecast compared to last year's projections show:

PROBABLE LOAD FORECAST - 1986 VERSUS 1985

Electric Service	1986	1985
Gross Requirements 1996/97 (GW.h)	48 530	47 310
Average Annual Growth Rate 1985//86 to 1996/97 (%/year)	2.4	2.4

1.1 Economic Assumptions

The B. C. economy is forecast to average 3.3% real annual growth (GDP) over the period to 1996. Swings above and below this rate will occur due to events such as Expo 86 with higher than average growth in 1986 and lower than average growth in 1987 expected. The projected growth is somewhat higher than was forecast last year and is mainly from higher growth expected in the service sectors.

The population forecast has been reduced marginally over last year's forecast with the present high unemployment levels being the main factor. Growth through 1996 is now expected to average 1.3% per year.

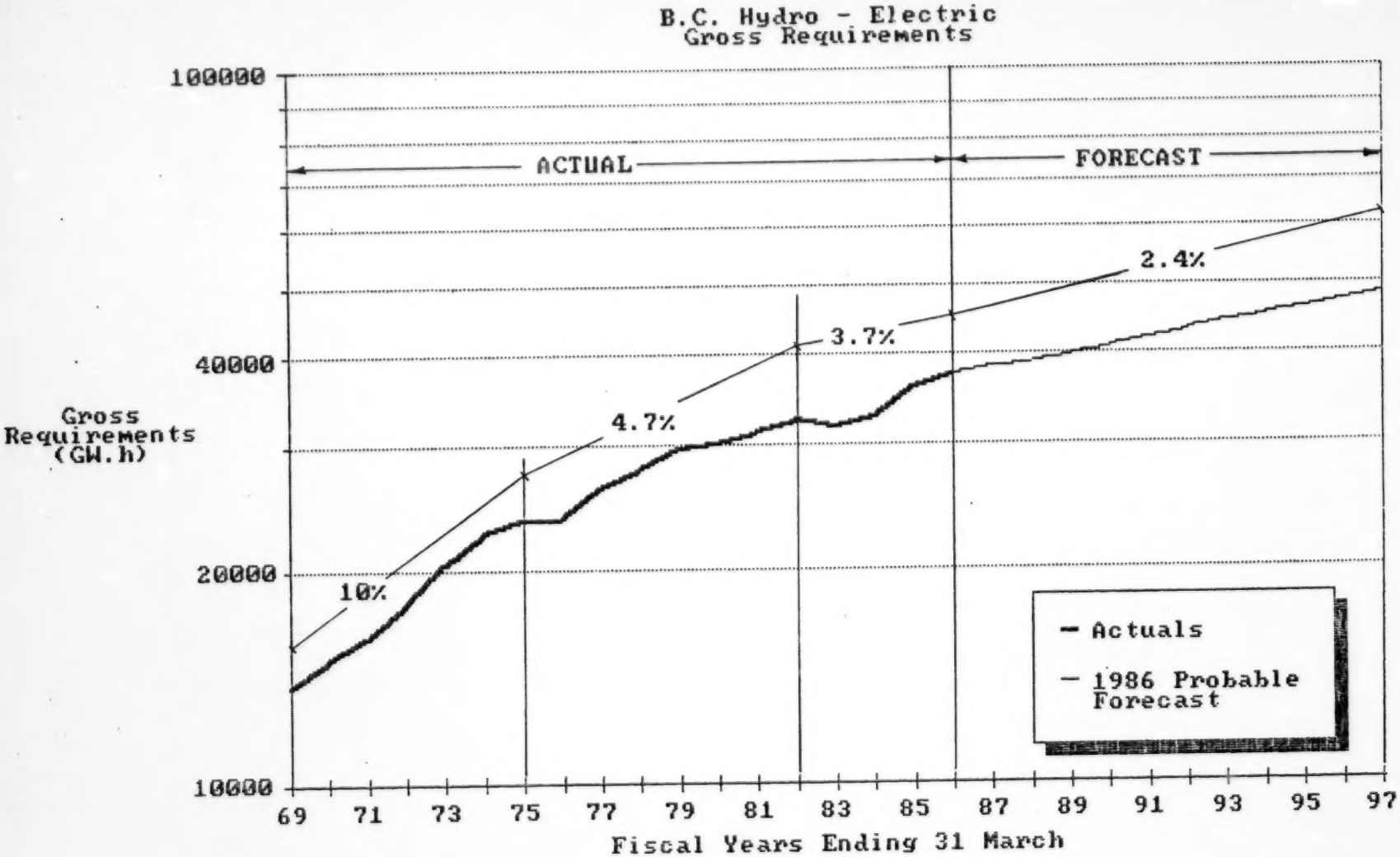
B.C. Hydro - Electric
Gross Requirements
100000
40000
20000
10000
Gross
Requirements
(GW.h)
ACTUAL
FORECAST
10%
4.7%
3.7%
2.4%
Actuals
1986 Probable
Forecast
69
71
73
75
77
79
81
83
85
87
89
91
93
95
97
Fiscal Years Ending 31 March

Figure 1

1.2 Electric Service Forecast

The probable electric energy requirements are forecast to increase from 37,429 GWh in 1985/86 to 48,530 GWh in 1996/97 for an average annual growth rate of 2.4%. Figure 1 shows projected and historical gross requirements and growth rates.

This year's forecast is marginally higher (1200 GWh) for 1996/97 than last year's. The significant changes are:

- higher residential sales with lower electric prices more than compensating for the lower population projections;
- higher commercial sales due to lower electric prices and increased demand for services;
- little net change in the industrial sales forecast with higher projections in the paper and allied area being offset by lower projections in the chemicals and unspecified load categories.

To give an estimate of forecast uncertainty, a range has been prepared around the probable forecast:

- a band around the probable forecast (probable low to probable high) reflects the uncertainty inherent in the forecast even if the economic projections (GDP and population) were to occur as forecast. Electric intensive industries proceeding or not proceeding, domestic marketing programs, and energy prices can cause considerable variations in electric sales within a given economic outlook.
- low and high forecasts reflect a wide range that the economic forecasts are expected to fall within.

2.0 ECONOMIC FORECAST

This section describes briefly the major assumptions underlying the probable sales forecasts: economic growth outlook, population forecast, commercial and industrial sectoral outlooks and energy price trends. The basis for the economic forecasts was provincial government projections.

2.1 Economic Growth

Overall provincial economic growth (GDP) projections are based on the latest long-term projections of the provincial government. Additional sources were used to obtain the latest available information regarding the energy intensive sectors: the Council of Forest Industries (COFI) on the outlook for pulp and paper in B. C.; and consultants for the mining (copper, coal and smelting) outlook.

The forecast of long-run GDP growth through 1996 is for an average annual increase of 3.3 percent. Fluctuations are to be expected above and below the overall trend. However, for long run forecasting the trend provides a more realistic and usable variable.

2.2 Population Forecast

The population forecast is based on recent estimates by the Ministry of Economic Development. Net migration into B. C. is forecast to average 21,000 annually to 1996. This is considerably below the historic 10-year average of 31,000, and is indicative of the continued high level of unemployment and the relatively lower level of economic activity that is projected. Not until the end of the forecast period is in-migration seen rising again to the historic level of 31,000 people annually.

The population for B. C. is forecast to rise from 2,907,000 in 1986 at an average annual rate of 1.3% to 3,321,000 in 1996. This is slightly lower than last year's projected 1.5% average annual increase with a 1996 estimate of 3,388,000.

2.3 Sectoral Outlooks

The main sectoral divisions are between commercial (service producing) and industrial (goods producing). The commercial sector, which accounted for approximately 72 percent of GDP in 1985, is expected to grow marginally faster than the industrial sector through the period.

The resource-based sectors, forestry and mining, and their related manufacturing activities will continue to provide a major portion of B. C.'s economic output, although they will no

longer be the main drivers of economic growth that they have been in the past. This is the result of the limited availability and quality of raw material in the forest industry and the poor price and market outlook in certain mining sectors.

Within the commercial sector, the community, business and personal services sector is projected to show the highest growth rates. Tourism and personal services, within the sector, are expected to be the highest growth areas.

Within the industrial sector, other (non-resource-based) manufacturing is expected to have the highest growth rate. This will occur as more emphasis is placed on diversification of the B. C. economy.

Metal mining will continue to have growth constrained by increased production from developing countries. In particular, copper and molybdenum prices will remain depressed by the considerable supplies available and limited growth in world consumption. No new major mine development is expected in the period. In the associated manufacturing area much of the world's copper smelting capacity is becoming old and has high energy costs. B. C. will likely be able to, as a result, support a copper smelter and one is projected for the mid-1990's.

Coal production increases will be limited by the present world oversupply situation for metallurgical coal and limited growth in requirements and also the recent drop in energy prices (oil and gas) that will slow the growth in thermal coal use. Only moderate increases in metallurgical coal output is expected and that from existing mines presently producing at less than capacity. Some moderate expansion of thermal coal production from small, high quality new mines is expected.

Wood manufacturing is B. C.'s most important industry and is projected to remain so through the period. The longer term outlook for wood products is positive but a major increase in production from B. C. is limited by the timber resource. A trend to higher value-added products is expected through better utilization of the resource and further growth in re-manufacturing.

The pulp and paper industry has recently been operating at high capacity levels and with firming prices the companies are in a more favourable position than in the last few years. The longer term outlook for product requirements and prices is positive. Thus, modernization, capacity expansions and some new projects are expected to occur through the period. Raw material availability is a constraining factor but new technologies allow for use of more of the raw material as well as different species of trees in making pulp. Thus, material constraints, at least through this century, are not as severe as for wood manufacturing. Additional industry growth will come

from a continual move towards manufacturing higher value-added paper products.

Growth in other energy intensive industries is expected to be limited. The chemical industry largely supports the chemical pulp industry. Increases in chemical pulp production will be small as most new pulping capacity is expected to be mechanical which requires few chemicals. One or more of the refineries located in the Lower Mainland are expected to close as they are small and relatively inefficient by present industry standards, and there currently exists an excess of refining capacity in Western Canada.

2.4 Energy Prices

Future rates for electricity depend on revenue requirements which in turn depend on both the costs for existing plant and the costs for additional plant needed to meet load growth as well as other factors such as taxes, export revenues from surplus sales and the cost of servicing U.S. dollar denominated debt. It is difficult to predict precisely what rates will be but using B. C. Hydro's Corporate Financial Model trends can be identified. This year's projection for electricity prices is for constant nominal prices through 1990 (assuming inflation in the 4% to 5% range, this translates into a real price decline of approximately 20%) and constant real thereafter.

Natural gas prices (on average) are assumed to parallel electricity prices, i.e. constant nominal through 1990 and then constant real.

Oil prices for 1986 are projected to be roughly half of those for 1985, i.e. average about $14 per barrel. Prices, in real terms, are projected to increase to the $20 per barrel level by the early 1990's and then remain constant (in real terms) thereafter.

The effect of this outlook for energy prices on the forecast is expected to occur as follows:

- with the overall level of energy prices falling below recent levels in real terms, increased usage of electricity and gas is to be expected. It is probable, however, that this increased usage will take the form of less conservation being implemented rather than increasing consumption levels through new uses and patterns of use. The pressure in B. C. on real income levels and the resource industries (competitiveness in world markets) will act against any significant increases in energy use, and

- with the relative levels of energy prices (between electricity, gas and oil) expected to be similar to recent history for the major portion of the period, no significant change in fuel substitution patterns is projected to occur.

3.0 ELECTRIC FORECASTS

The population, economic, sectoral and energy price forecasts described in the previous section are translated into electricity requirements using a "top down/end use" approach to forecasting. The top down aspect of the approach entails the use of the population and economic forecasts and sectoral outlooks to project the household formation, commercial activity and industrial production that generate the need for electricity. The end use focus consists of analysis of how various customers presently use electricity and how consumption patterns are likely to change in the future.

The effects of energy price changes are examined by first establishing the scope customers have for changing electricity use by measures such as: installing more efficient appliances and higher levels of insulation, choosing an alternative source of energy for heating, switching to more efficient lighting, substituting other energy sources or modifying the way electricity is used in existing industrial processes, changing industrial processes, or self-generating electricity rather than purchasing.

The principal components of the 1986 Probable Load Forecast to 1996/97 are summarized in Table 1. A discussion by forecast sector and including more explanation on methodology and energy price effects follows.

Table 1

B.C. HYDRO ELECTRIC BILLED SALES AND GROSS REQUIREMENTS - 1996/97

Category (a)	Actual 1985/86 Sales (GW.h)	Increase in Sales - 1985/86 to 1996/97 (GW.h)	Projected 1996/97 Sales (GW.h)	Avg. Ann. Growth Rate: 1985/86 to 1996/97 (%/yr)
Residential	9,793	2,218	12,011	1.9
Commercial	8,315	3,174	11,489	3.0
Industrial	14,577	4,137	18,714	2.3
Other (b)	452	247	699	4.0
Total Billed Sales	33,137	9,776	42,913	2.4
Losses & Accruals	4,292	-	5,617	-
Gross Requirements	37,429	-	48,530	2.4

(a) The industrial and commercial categories do not correspond to B.C. Hydro's Rate categories. A breakdown of the above industrial and commercial sales into B.C. Hydro categories is presented in Tables 2,3 and 4.

(b) Inter-utility transfers (including WKP&L actuals for 1985/86 but none projected for 1996/97) and firm export (including SCL).

3.1 Residential Sector

The forecast growth rate in Residential sales is 1.9% per annum. Total sales will increase from 9794 GW.h in 1985/86 to 12011 GW.h in 1996/97. Compared with last year's forecast, sales in 1996/97 are about 450 GW.h higher. This is a result of the combined impact of a slightly lower population projection (3,321,000 forecast this year for B. C. versus 3,388,000 forecast last year for 1996) which tends to reduce the forecast, and a significantly reduced conservation impact which offsets and raises the forecast. Details of the projections are provided in Table 2.

Table 2

RESIDENTIAL ELECTRIC SALES FORECAST
(Billed Basis, No Adjustment For Accrual)

Fiscal Year	Average Residential Accounts (000)	Percent Electric Heating (%)	Annual Average Use Per Account: Non Electric Heating (kW.h)	Electric Heating (kW.h)	All Accounts (kW.h)	Total Sales (GW.h)
1984/85 (Actual)	998.8	17.0	8,255	16,103	9,589	9,577
1985/86 (Actual)	1,016.5	17.5	8,429	15,318	9,635	9,794
Avg. Annual Growth (%) 10 years:						
75/76 - 85/86	3.1	-	1.0	-2.7	1.4	4.6
FORECAST						
1986/87	1,033.4	18.3	8,471	14,970	9,657	9,979
1987/88	1,052.9	18.9	8,475	14,880	9,684	10,196
1988/89	1,073.2	19.5	8,486	14,818	9,720	10,422
1989/90	1,094.9	20.0	8,493	14,715	9,737	10,661
1990/91	1,117.6	20.4	8,523	14,629	9,768	10,916
1991/92	1,140.6	20.7	8,520	14,523	9,764	11,137
1992/93	1,163.6	21.0	8,501	14,400	9,742	11,336
1993/94	1,186.7	21.3	8,455	14,260	9,692	11,501
1994/95	1,210.4	21.6	8,390	14,112	9,624	11,649
1995/96	1,235.3	21.8	8,326	13,955	9,554	11,802
1996/97	1,260.5	22.0	8,311	13,835	9,529	12,011
Avg. Annual Growth (%) 11 years:						
85/86 - 96/97	2.0	-	-0.1	-0.9	-0.1	1.9

The forecast of average residential accounts is developed from the population forecast by applying age specific headship rates and dwelling preference factors to distribute households by type of dwelling. In 1985/86, the B. C. Hydro household dwelling mix was 64% houses, 4% row houses, 23% apartments, 5% mobile and 4% seasonal. In 1996/97, the mix is forecast to be 60% houses, 6% row houses, 25% apartments, 5% mobile and 4% seasonal.

The choice of space heating fuel for new homes is a significant factor in the determination of total electric sales. The relative costs of gas and electric space heating have been calculated historically based on average residential rates. From the historic relationship between relative price and actual capture rates at a Divisional level, the 1986/87 Provincial net capture rates for electric space heating (excluding Vancouver Island) have been estimated at 19% for single family dwellings, 50% for row housing and 62% for apartments. For Vancouver Island, the 1986/87 net capture rate is projected to remain close to 100%.

The effects of lower projected real electricity prices in this year's forecast will result in less conservation measures being carried out and annual usage rates throughout the period that are higher than those projected last year. Usage rates in the non-electric heating sector, which are largely a function of household appliances, will eventually decline as more efficient appliances (largely imported) are used. Usage rates in the electric heating sector will decline as a result of not only more efficient appliances and better insulation levels but also as a result of the mix containing an increasing portion of row houses and apartments, which are generally smaller in size than single family dwellings.

Although the real price of both electricity and gas are projected to drop substantially in the short term, the relative price between the fuels is not expected to change significantly through the period. The heating capture rates are thus projected to remain relatively constant over the forecast period. The influencing factors of improving furnace efficiencies and the shift towards multiple dwellings which have higher capture rates for electric space heating largely offset one another.

3.2 Commercial Sector

Commercial sales are expected to grow at 3.0% per year over the forecast period increasing from 8315 GW.h in 1985/86 to 11489 GW.h in 1996/97. Compared to last year's forecast commercial sales in 1996/97 have been increased about 500 GW.h. This is partially attributable to the higher economic growth rates anticipated in the commercial sector. As well a reduced energy price forecast tends to negate the previously projected conservation levels. Table 3 provides details of the commercial forecast by major Standard Industrial Classification (SIC) category.

Table 3

COMMERCIAL ELECTRIC SALES FORECAST
(Billed Basis, No Adjustment For Accrual)

Fiscal Year	By Standard Industrial Classification (SIC)							By Rate Category		
	Transportation Communication & Other Utilities (GW.h)	Wholesale & Retail Trade (GW.h)	Finance, Insurance & Real Estate (GW.h)	Community, Business & Pers. Serv. (GW.h)	Public Admin. & Defence (GW.h)	Unclass-ified (GW.h)	Total Sales (GW.h)	General (GW.h)	Trans. Rate (GW.h)	Other (a) (GW.h)
1985/86 (Actual)	1,284	1,918	1,564	2,849	615	85	8,315	7,577	343	395
FORECAST										
1986/87	1,327	1,986	1,616	2,955	620	89	8,592	7,851	350	391
1987/88	1,356	2,023	1,664	3,024	626	91	8,784	8,026	360	398
1988/89	1,387	2,084	1,709	3,094	633	93	9,000	8,227	365	408
1989/90	1,432	2,141	1,758	3,169	639	96	9,234	8,441	375	418
1990/91	1,479	2,192	1,805	3,268	655	98	9,497	8,682	390	425
1991/92	1,528	2,247	1,853	3,384	675	101	9,788	8,953	400	435
1992/93	1,574	2,305	1,904	3,519	695	105	10,101	9,247	410	444
1993/94	1,632	2,366	1,956	3,660	716	108	10,438	9,574	410	454
1994/95	1,687	2,427	2,010	3,806	737	112	10,779	9,906	410	463
1995/96	1,745	2,490	2,064	3,958	759	115	11,131	10,238	420	473
1996/97	1,799	2,554	2,120	4,115	782	119	11,489	10,579	425	485
Avg. Annual Growth (%) 11 years:										
85/86 - 96/97	3.1	2.6	2.8	3.4	2.2	3.1	3.0	3.1	2.0	1.9

(a) The 'Other' rate category includes Irrigation, Street Lighting and B.C. Hydro Own use.

Growth in the transportation and communication sector is slightly above the commercial average based on the inclusion of some electric pumping loads for natural gas in the transportation sector.

Electricity sales to the wholesale and retail trade sector are expected to grow at an average annual rate of 2.6% over the forecast period. This level of growth reflects a continuation of the long term expansion of retail trade in the economy, tempered by significant improvements in energy efficiency of new facilities.

Electricity sales in the finance, insurance, and real estate (FIRE) sector are largely related to office space. Although there is currently a high vacancy rate, especially in downtown Vancouver, the long term outlook is for continued expansion of office space. This is consistent with the goal of making Vancouver a financial center. Energy efficiency in office buildings is also continuing to improve but the full impact is somewhat offset by the increased use of electronic equipment in the office automation process. Overall electricity sales are expected to grow at an average annual rate of 2.8% from 1564 GW.h in 1985/86 to 2120 GW.h in 1996/97.

The service sector is expected to be a main driving force in the economy of B. C. over the forecast period. Based partially on the anticipated long term benefits of Expo 86, a long term average annual economic growth rate higher than total GDP is expected. Most of this will be realized in accommodation, food services, recreation, business management, and all associated commercial services. The health and education components of the service sector will not grow as rapidly as they are dependent upon population growth and upon the shifting age profile. Overall the service sector is the largest component of commercial electricity sales and is forecast to increase at 3.4% per annum from 2849 GW.h in 1985/86 to 4115 GW.h in 1996/97. This accounts for 40% of the total commercial growth of 3200 GW.h.

The public administration sector will be the slowest growing with governments continuing to reduce their budget deficits by controlling size and expenditures. Electricity sales will rise by 2.2% annually to 782 GW.h by 1996/97.

3.3 Industrial Sector

Industrial sales are projected to grow by 4137 GW.h and account for over 40% of the total increase in billed sales expected between 1985/86 and 1996/97. This represents a growth rate of 2.3% per year. Table 4 presents a breakdown of the Industrial sales increase to 1996/97 by type of industry. Sales projections for the Industrial Domestic Marketing programs are included in Table 4 and detailed in Table 5. Discussion by category (SIC) follows.

Table 4
INDUSTRIAL ELECTRIC SALES FORECAST
(Billed Basis - No adjustment For Accrual)

	By Standard Industrial Classification (SIC)									By Rate Category		
	Primary Industries			Manufacturing				Construction				
Fiscal Year	Metal Mines (GW.h)	Mineral Fuels (GW.h)	Other (GW.h)	Wood (GW.h)	Paper & Allied (GW.h)	Chemicals & Prod. (GW.h)	Other (GW.h)	(GW.h)	Total (GW.h)	General (GW.h)	Trans Rate (GW.h)	Domestic Marketing (a) (GW.h)
1985/86 Actual	2160	670	229	1825	6586	1298	1633	176	14577	3260	10307	1010
FORECAST												
1986/87	2422	698	232	1865	6319	1513	1673	180	14901	3217	10670	1014
1987/88	2538	743	235	1820	6164	1571	1708	183	14962	3177	10955	830
1988/89	2465	763	242	1875	6347	1541	1832	191	15256	3243	11295	718
1989/90	2295	784	251	1900	6515	1551	2063	200	15557	3332	11565	660
1990/91	2295	805	256	1940	6792	1588	2193	209	16080	3455	11965	660
1991/92	2426	816	261	1960	7075	1646	2253	217	16654	3594	12615	445
1992/93	2498	837	266	1980	7263	1688	2312	226	17070	3690	13080	300
1993/94	2499	873	272	2000	7432	1706	2373	235	17389	3789	13600	0
1994/95	2436	899	277	2020	7560	1734	2541	244	17710	3890	13820	0
1995/96	2477	915	282	2040	7713	1766	2805	254	18253	3993	14260	0
1996/97	2479	921	286	2050	7816	1799	3101	263	18714	4079	14635	0
Avg. Annual Growth: % 11 years: 85/86-96/97	1.3	2.9	2.0	1.1	1.6	3.0	6.0	3.7	2.3	2.1	3.2	-

(a) See Table 5 for breakdown of Domestic Marketing.

3.3.1 Metal Mines

The major electricity users in the metal mining industry are the large open pit copper and molybdenum mines. With a relatively poor price outlook for these metals little change is seen in electric sales through 1996. Some moderate expansions and reopening of presently closed mines will be offset by closures of existing mines as ore is depleted. Endako, Goldstream and Highmont are expected to reopen and some increase in electricity requirements occur with the Valley/Lornex merger. Mines expected to close are Afton, Brenda, Bell and Equity. The net result is an increase in sales of 300 GWh by 1996/97.

3.3.2 Mineral Fuels

Electric sales to the mineral fuels sector are primarily associated with the large open pit coal mines. Only very small increases in coal output and hence electric sales are expected over the period from existing customers. The only new customers projected are two small high quality thermal mines with a combined electric load of 50 GWh. A natural gas liquids (NGL) extraction plant came on line in 1985/86. Its load is projected to increase to 150 GWh from the initial 1985/86 load of 40 GWh.

3.3.3 Other Primary Industries

The other primary industries consist of agriculture, forestry, fishing, mines other than metal or coal, quarries and sand pits and incidental services. Only moderate electric sales growth is expected.

3.3.4 Wood Manufacturing

The wood manufacturing sector is expected to show limited growth in electric sales as harvesting is approaching the allowable annual cut. Some increased sales are expected from additional value added production as well as electric wood drying facilities.

3.3.5 Paper and Allied

The paper and allied product sector is projected to show a significant increase in sales. The 1985/86 base year figure of 6586 GW.h includes 550 GW.h sold under the short term marketing program, Off Oil - Steam Turbine or Rate 1844. With a revised base to include permanent sales only, the actual growth in sales to 1996/97 will be more like 1800 GW.h rather than the 1230 GW.h net figure shown. The continuing shift to electric intensive processes, i.e. mechanical pulping (which is approximately three times as electric intensive as chemical pulping) rather than

production increases is the main reason for greater projected electric sales. Conversion of stone groundwood to thermo-mechanical pulping (TMP), more value added production through more and varied papers and the probable use of the chemi-thermo-mechanical pulping (CTMP) process for new greenfield mills are all electric intensive.

In addition to expansions and modernization at several existing mills by 1996, two new greenfield CTMP mills are projected to come on line. Additional co-generation in the order of 500 GWh is also projected by 1996 and incorporated into the forecast.

3.3.6 Chemicals and Chemical Products

Electric sales to the chemical and chemical products sector are presently almost totally associated with the pulp and paper industry with the chemical pulping process being the major user of the chemicals. With very little growth in chemical pulp production expected, limited growth in new chemical requirements is foreseen. Recapture of some lost markets and limited development of new offshore markets by the chemical companies will lead to modest growth in electric sales.

The potential for growth in sales to the chemical sector still exists from potential manufacturing loads associated with the natural gas industry. The only project now expected to 1996 is the ammonia plant at Kitimat presently being built. The load will be 100 GWh.

3.3.7 Other Manufacturing

The other manufacturing category contained in Table 4 includes both other primary and manufacturing industries as well as unspecified load. The major electricity users are:

- Food and Beverage Manufacturing. Growth in sales from 364 GWh in 1985/86 to 483 GWh in 1996/97 is projected;

- Primary Metal. A copper smelter using 230 GWh accounts for the majority of growth from 139 GWh in 1985/86 to 421 GWh in 1996/97;

- Non-Metallic Mineral Products. Electric sales are largely associated with cement and fibreglas production and growth from 310 GWh in 1985/86 to 421 GWh in 1996/97 is related to the construction industry;

- Petroleum and Coal Products. Sales are largely to the oil refineries. One or more of the Lower Mainland refineries are expected to close in the period thus

sales of 362 Gwh in 1985/86 are projected to decline to 317 GWh in 1996/97;

- Miscellaneous Manufacturing. While the remaining manufacturing is not electric intensive a relatively high economic growth rate is expected for other manufacturing sectors. A growth in sales from 458 GWh in 1985/86 to 759 GWh in 1996/97 is projected;

- Unspecified Load. Included by 1996/97 is unspecified load of 700 GWh. A major portion of this (400 GWh) is for sales under the marketing program Incentive Discount (rate 1845) in the late 1980's. This load is assumed to be permanent load and will eventually transfer to the Transmission Rate category. As well, a further 300 GWh of unspecified (Transmission Rate) load is included in the mid-1990's.

3.3.8 Construction

Electric sales to the construction industry are small compared to the construction sector's relative importance to total GDP (accounts for approxmately 6%). Growth in sales is related to the growth in construction sector activity.

3.4 Other Sales

Included here are inter-utility and firm export sales. West Kootenay Power and Light Company (WKP&L) and Seattle City Light (SCL) are included here. Sales are projected to grow from 452 GWh in 1985/86 to 699 GWh in 1996/97. Seattle City Light sales, under the agreement not to raise the Ross Dam to avoid flooding the Skagit Valley, go from 134 GW.h in 1985/86 to 318 GW.h in 1986/87 and remain at that level thereafter. No firm requirements for WKP&L are included in this year's forecast. The remainder of the sales are largely to the City of New Westminster.

3.5 Industrial Marketing Programs

Sales under the Industrial Domestic Marketing Programs are included in Table 4. A brief description of the various programs included in this forecast and to what sectors the sales are expected to be made is provided here. See Table 5 for details.

Table 5

INDUSTRIAL MARKETING PROGRAMS

Fiscal Year	Block Recovery (Rate 1843) (G.Wh)	Turbine Turndown (Rate 1844) (G.Wh)	Industrial Rate Discount Act-Bill 28 (Rate 1845) (G.Wh)	Critical Industries Act-Bill 31 (Rate 1846) (G.Wh)	Total Industrial Marketing (G.Wh)
1985/86 Actual	121	557	184	148	1,010
FORECAST					
1986/87	0	200	400	414	1,014
1987/88	0	0	400	430	830
1988/89	0	0	285	433	718
1989/90	0	0	60	600	660
1990/91	0	0	45	615	660
1991/92	0	0	0	445	445
1992/93	0	0	0	300	300
1993/94	0	0	0	0	0
1994/95	0	0	0	0	0
1995/96	0	0	0	0	0
1996/97	0	0	0	0	0
Avg. Annual Growth: % 11 years: 85/86-96/97	-	-	-	-	-

3.5.1 Turbine Turndown (Schedule or Rate 1844) is to allow purchased electricity to replace the customer's own generation from heavy fuel oil or wood waste and heavy fuel oil. Sales have been to pulp and paper mills located in non-natural gas areas, i.e. mainly on Vancouver Island. The 200 GWh included in the forecast for 1986/87 assumed that the drop in oil prices would severely limit sales. However, an adjustment of the rate, tying it to oil prices, has allowed sales to carry on at previous levels. The rate is scheduled to end 31 March 1987 and thus no sales have been included after the 1986/87 fiscal year. It is now (January 1987) probable, however, that the rate will be extended. See APPENDIX A.

3.5.2 Industrial Electricity Rate Discount Act - Bill 28 (Schedule or Rate 1845) involves rates and level of sales negotiated on an individual customer basis and for varying lengths of time. Contracts have been negotiated that run into the early 1990's. The Act is mainly intended to promote increased production, expansion and new industry but has also been used as a vehicle to reopen the Placer-Endako molybdenum mine. Sales are largely to pulp and paper mills, metal mines and large chemical plants. Two new major unspecified loads (likely manufacturing in the smelting or pulp and paper areas) of 200 GW.h each are included, the first starting in 1988 and the second starting in 1989. Permanent load, such as due to expansions and the two major unspecified new loads, is assumed to be under the Transmission Rate category when the contractual period expires. Thus, no Schedule 1845 load is assumed beyond 1992/93.

3.5.3 Critical Industries Act - Bill 31 (Schedule or Rate 1846) is a vehicle for reopening or keeping open industries in B. C. through electricity rate discounts which are part of a package of taxation, labour cost and other concessions. The contracts are negotiated on an individual basis and for varying lengths of time. The major electricity using customers shown under Bill 31 in this forecast are two metal mines (Bell and Brenda) and Western Canada Steel. No sales are assumed beyond 1990/91 with Bell and Brenda assumed to close in the late 1980's with depletion of economical ore and Western Canada Steel reverting to their original rate (Rate 1278).

3.6 Forecast by Rate Category

The forecast, as described in the foregoing sections, is developed along homogenous lines, i.e. residential, commercial and industrial sectors. For planning purposes and revenue projections, however, it is necessary to translate the base forecast into rate categories.

The residential sector requires no translation, i.e. the projected sector corresponds to the Residential Rate category.

The commercial and industrial sectors each encompass several rate categories. The major rate categories are: General, which in itself encompasses the Under 35 kW (generally smaller commercial customers) and the 35 kW and Over (generally larger commercial and some industrial customers) categories; Transmission Rate which includes customers of approximately 5 MW and higher demand; other smaller commercial rates, i.e. Irrigation, Street Lighting and B. C. Hydro Own Use; specific marketing programs, with varying rates, in the industrial area. Translation to the various rate categories is accomplished using: projections of the Transmission Rate load by individual customer (the total number now being approximately 75); plans specific customers have for transferring between categories, this generally means from 35 kW and Over to Transmission Rate; recent growth patterns in customers and in sales in the various categories.

As shown in Table 3, the majority of load in the commercial sector falls into the General rate category. The small portion of load in the Transmission Rate category is to the few large commercial customers such as UBC, grain and other bulk loading terminals. Load for the "other" smaller rate categories of Irrigation, Street Lighting and B. C. Hydro Own Use is all assumed to be in the commercial sector.

Table 4 shows the rate breakdown for industrial sales. Nearly half of the sales to the General category are from the wood manufacturing sector as wood manufacturing facilities generally are under 5 MW in (demand) size. Transmission Rate sales encompass all the large production facilities such as mines, pulp mills and chemical plants. The domestic marketing programs have been previously described.

Table 6 provides forecast details by the major rate categories.

Table 6

B.C. HYDRO HISTORICAL AND PROBABLE ELECTRIC FORECAST BY SALES CATEGORIES
(Billed Sales, No Adjustment For Accrual)

Fiscal Year	Resident. (G.Wh)	General (G.Wh)	Trans. Rate (G.Wh)	Other (a) (G.Wh)	Domestic Marketing Programs (c) (G.Wh)	Total Billed Sales (G.Wh)	Losses & Accruals (G.Wh)	Total Gross Req'ts (G.Wh)	Peak (MW)
HISTORICAL									
1975/76	6,258	7,062	6,808 (b)	532		20,660	2,878	23,538	4,232
1976/77	6,625	7,592	8,166	541		22,924	3,072	25,996	4,421
1977/78	7,051	8,073	8,479	561		24,164	3,372	27,536	4,800
1978/79	7,492	8,512	9,133	583		25,720	3,628	29,348	5,122
1979/80	7,727	8,949	9,217	625		26,518	3,455	29,973	5,231
1980/81	8,042	9,344	9,597	581		27,564	3,594	31,158	5,511
1981/82	8,640	9,706	9,339 (b)	623		28,308	4,051	32,359	5,939
1982/83	8,821	9,704	9,046	635		28,206	3,307	31,513	5,537
1983/84	9,005	9,829	9,074 (b)	622	190	28,720	3,825	32,545	6,246
1984/85	9,577	9,829	10,746	642	446	31,240	4,602	35,842	6,226
1985/86	9,793	10,837	10,650	847	1,010	33,137	4,292	37,429	6,851
Avg. Annual Growth: %									
10 years:									
75/76-85/86	4.6	4.4	4.6	4.8	-	4.8	4.1	4.7	4.9
FORECAST									
1986/87	9,979	11,068	11,020	992	1,014	34,073	4,447	38,520	6,960
1987/88	10,197	11,203	11,315	1007	830	34,552	4,518	39,070	6,960
1988/89	10,422	11,470	11,660	1026	718	35,296	4,614	39,910	7,110
1989/90	10,661	11,774	11,940	1045	660	36,080	4,720	40,800	7,270
1990/91	10,916	12,137	12,355	1061	660	37,129	4,851	41,980	7,470
1991/92	11,137	12,547	13,015	1080	445	38,224	4,996	43,220	7,690
1992/93	11,336	12,937	13,490	1099	300	39,162	5,118	44,280	7,870
1993/94	11,501	13,363	14,010	1119		39,993	5,237	45,230	8,040
1994/95	11,649	13,796	14,230	1140		40,815	5,345	46,160	8,210
1995/96	11,802	14,230	14,680	1162		41,874	5,476	47,350	8,420
1996/97	12,011	14,638	15,060	1184		42,913	5,617	48,530	8,620
Avg. Annual Growth: %									
11 years:									
85/86-96/97	1.9	2.8	3.2	3.1	-	2.4	2.5	2.4	2.1

(a) "Other" includes Irrigation, Street Lighting, B.C. Hydro Use, Inter-Utility (including WKP&L sales considered firm) and Out of Province Firm (including Seattle City Light).

(b) Forest industry labour disruptions in 1975/76, 1981/82 and 1983/84 caused reductions in Transmission Rate sales.

(c) Domestic Marketing Programs are detailed in Table 5.

4.0 ELECTRIC FORECAST UNCERTAINTY

Actual electricity sales will vary from the probable forecast as a result of either or both of: a higher or lower intensity of electrical use for the given economic/demographic forecasts on which it is based; or variations in these economic/demographic forecasts.

4.1 Uncertainty Factors

Major factors which can markedly affect the forecast are:

- energy prices. Changes in real electricity prices will impact on the amount and rate of conservation being carried out. Changes in electricity prices relative to oil and natural gas prices will affect such items as electric heating penetration, choice of new equipment and some industrial processes;

- economic growth (GDP). Overall economic growth has a direct link to expected electric sales. Within the overall GDP, however, many of the sectors are more electric intensive than others. The industrial sectors, in general, use much more elecricity per unit GDP than the commercial sectors do;

- population growth. Variations in population growth directly affect the residential sector sales forecast and indirectly affect the commercial sector sales forecast;

- major projects. It is not possible to quantify an individual project in terms of impact on overall (or even sectoral) GDP. Thus considerable variation in electricity requirements are possible within a few electric intensive developments;

- service to WKP&L. An agreement to provide for WKP&L load growth will add to the forecast.

The following Table 7 provides a comparison of the impact of changes in these variables on the forecast. In order to show meaningful relationships, variation in economic growth assumes the same relative sectoral composition (i.e. no change in electric intensity).

Table 7
FORECAST SENSITIVITIES

Forecast Element	1986 Forecast Probable Assumption	Alternative Assumptions	Effect on Forecast by 1996/97: Sales (G.Wh)	Effect on Forecast by 1996/97: Avg. Annual Growth for 11 Year Period (%)
1. Electricity Prices	No Price increase for 5 years.	1) 10% increase by 1990.	-300	-0.07
		2) 20% increase by 1990.	-700	-0.16
2. Economic Growth	Average annual growth of 3.3% to 1996.	1) Average of 2.8%	-1300	-0.29
		2) Average of 3.8%	1400	0.30
3. Population Growth	Average annual growth of 1.3% to 1996.	1) Average of 0.8%	-600	-0.13
		2) Average of 1.8%	700	0.15
4. Major Projects:				
- Greenfield CTMP mills.	2 by mid-90's	1) 1 mill.	-375	-0.08
		2) 3 mills.	375	0.08
- Major metal (copper) mines.	Highmont reopens and Newmont running.	1) 1 is closed.	-260	-0.06
- Marketing (Bill 28) unspecified loads.	2 by late 80's	1) None.	-400	-0.09
		2) 1	-200	-0.05
5. Service to WKP&L.	Not included	1) Included	950	0.20

4.2 Intensity of Electricity Use -
Probable Low and Probable High Forecasts

In order to illustrate the uncertainties in electric usage, assuming the probable economic/population forecasts develop over the longer term, a band is developed around the probable electric forecast. In the short term, effects such as weather, strikes, closures (or openings) of major customers cannot be foreseen. Short term sales are varied based on recent actual fluctuations that have occurred.

A basis of uncertainty in the longer term is the energy price assumptions. Higher or lower energy prices can cause wide variations in electricity consumption through different conservation development rates, electric heating penetration, etc. Adding to this is the effect of the number and type of new residential customers, the type of commercial construction and the number and size of major electric intensive projects (e.g. CTMP, mines, marketing loads). Longer term sales variations are developed by assuming different conservation rates and intensity of electric usage in heating and major processes. See Tables 8 and 9 for details of these forecasts.

4.3 Variations in Economic Forecasts -
Low and High Forecasts

These scenarios are based on different economic (GDP) and demographic (population, household formation, etc.) patterns that could occur in B. C. Whereas the probable forecast assumes GDP growth to average 3.3% through 1996, the low forecast assumes 2.0% and the high forecast assumes 4.3%. Population growth in the probable is assumed at 1.3% through 1996, the low assumes 0.85% and the high 1.7%. The energy price forecasts are assumed the same for the low, probable and high forecast. See Tables 8 and 9 for details of these forecasts.

Table 8
B.C. HYDRO ELECTRIC GROSS LOAD REQUIREMENTS FORECAST
TOTAL B.C. HYDRO
1986 Forecast

Fiscal Year	LOW Total Gross Req'ts (G.Wh)	LOW Peak (MW)	PROBABLE LOW Total Gross Req'ts (G.Wh)	PROBABLE LOW Peak (MW)	PROBABLE Total Gross Req'ts (G.Wh)	PROBABLE Peak (MW)	PROBABLE HIGH Total Gross Req'ts (G.Wh)	PROBABLE HIGH Peak (MW)	HIGH Total Gross Req'ts (G.Wh)	HIGH Peak (MW)
	⟨---------- Range of Probable Forecasts ----------⟩									
1984/85 Actual	35,842	6,226	35,842	6,226	35,842	6,226	35,842	6,226	35,842	6,226
1985/86 Actual	37,429	6,851	37,429	6,851	37,429	6,851	37,429	6,851	37,429	6,851
1986/87	36,930	6,610	37,820	6,750	38,520	6,860	39,520	7,010	40,360	7,290
1987/88	36,970	6,620	38,210	6,820	39,070	6,960	39,990	7,110	41,120	7,450
1988/89	37,340	6,690	38,700	6,910	39,910	7,110	41,100	7,310	42,610	7,720
1989/90	37,660	6,750	39,300	7,020	40,800	7,270	42,250	7,520	44,060	8,000
1990/91	38,210	6,840	40,260	7,180	41,980	7,470	43,690	7,770	45,890	8,340
1991/92	39,160	6,990	41,300	7,350	43,220	7,690	45,310	8,050	47,490	8,640
1992/93	39,820	7,100	42,130	7,490	44,280	7,870	46,650	8,290	48,900	8,950
1993/94	40,220	7,170	42,760	7,610	45,230	8,040	47,870	8,510	50,440	8,970
1994/95	40,600	7,240	43,430	7,730	46,160	8,210	49,190	8,750	52,020	9,550
1995/96	41,130	7,330	44,320	7,880	47,350	8,420	50,760	9,030	54,070	9,910
1996/97	41,650	7,410	45,150	8,020	48,530	8,620	52,400	9,320	56,070	10,320
Avg. Annual Growth: % 11 years:										
85/86-96/97	1.0	0.7	1.7	1.4	2.4	2.1	3.1	2.8	3.7	3.8

Table 9
B.C. HYDRO ELECTRIC GROSS LOAD REQUIREMENTS FORECAST
TOTAL INTEGRATED SYSTEM
1986 Forecast

Fiscal Year	LOW Total Gross Req'ts (G.Wh)	LOW Peak (MW)	PROBABLE LOW Total Gross Req'ts (G.Wh)	PROBABLE LOW Peak (MW)	PROBABLE Total Gross Req'ts (G.Wh)	PROBABLE Peak (MW)	PROBABLE HIGH Total Gross Req'ts (G.Wh)	PROBABLE HIGH Peak (MW)	HIGH Total Gross Req'ts (G.Wh)	HIGH Peak (MW)
	⟨---------- Range of Probable Forecasts ----------⟩									
1984/85 Actual	35,680	6,193	35,680	6,193	35,680	6,193	35,680	6,193	35,690	6,193
1985/86 Actual	37,263	6,816	37,263	6,816	37,263	6,816	37,263	6,816	37,263	6,816
1986/87	36,760	6,570	37,650	6,710	38,350	6,820	39,340	6,970	40,190	7,250
1987/88	36,790	6,580	38,030	6,780	38,890	6,920	39,810	7,070	40,940	7,410
1988/89	37,130	6,650	38,520	6,870	39,730	7,070	40,920	7,270	42,430	7,680
1989/90	37,470	6,710	39,110	6,980	40,610	7,230	42,060	7,480	43,870	7,960
1990/91	38,020	6,800	40,060	7,140	41,790	7,430	43,490	7,730	45,700	8,300
1991/92	38,960	6,950	41,090	7,310	43,020	7,650	45,110	8,010	47,290	8,600
1992/93	39,610	7,060	41,920	7,450	44,070	7,830	46,450	8,250	48,690	8,910
1993/94	40,000	7,120	42,540	7,560	45,010	7,990	47,650	8,460	50,230	8,920
1994/95	40,380	7,190	43,210	7,680	45,940	8,160	48,970	8,700	51,800	9,500
1995/96	40,900	7,280	44,090	7,830	47,120	8,370	50,530	8,980	53,840	9,860
1996/97	41,420	7,360	44,910	7,970	48,290	8,570	52,160	9,270	55,830	10,270
Avg. Annual Growth: % 11 years:										
85/86-96/97	1.0	0.7	1.7	1.4	2.4	2.1	3.1	2.8	3.7	3.8

APPENDIX A

JANUARY 1987 ADDENDUM TO ELECTRIC FORECAST

REVISED DOMESTIC MARKETING PROGRAMS

Since the 1986 Electric Forecast was completed in mid-1986 a much increased emphasis has been placed on domestic marketing programs. As well, a decision by the British Columbia Utilities Commission (BCUC) in early Fall of 1986 has made it possible to include sales to West Kootenay Power and Light Company Limited (WKP&L) as a firm requirement. The impact, for purposes of revenue calculations, is significant. Thus, this addendum details the changes, i.e., the WKP&L sales and the latest marketing plans, that are being used for the January 1987 revenue projections (the basis for the 1987/88 Corporate Plan).

There will be some impact on system planning as well but no change to that portion of the Corporate Plan is recommended at this time. Many of the marketing programs are in their formative stage and much of the proposed new load is intended, in the longer term, to be interruptible. Thus, while sales in the shorter term are anticipated to be significant, the longer term sales will depend on program acceptance and energy availability. It is considered premature at this time to attempt to forecast marketing sales beyond an initial five year period.

No sales for WKP&L were included in the 1986 forecast. The BCUC decision now requires WKP&L to provide forecasts annually and make firm commitments for two years. Starting in 1991 WKP&L will have to provide firm commitments for 10 years. The nature of the decision is such that WKP&L is now considered as a firm long term load on the B. C. Hydro system. The level of the longer term load is not considered firm at this time, however, as WKP&L has other options (e.g. new generation) for supplying a portion of the load. The 1987 forecast is considered a target date for finalizing WKP&L's longer term requirements for system planning purposes. For revenue calculations, a full ten years at presently projected levels is assumed with the rationale being that sales not made to WKP&L could well obtain a similar revenue from the domestic marketing or export surplus areas. Refer to Table 10 for first 5-year sales projections.

The domestic marketing programs have changed considerably in number and sales composition from the 1986 forecast. There has also been an impact on the shorter term transmission rate sales with the transfer of Newmont Mines from that category to sales under the Critical Industries Act (Bill 31) for a three-year period. Refer to Table 10.

Changes in existing and brief descriptions of new marketing programs follows:

1. Turbine Turndown (Rate 1844) now assumed to be extended through 1988/89. Further 1 year extensions could occur as surplus or secondary energy availability occurs;

2. Electric Discount Act (Rate 1845) does not now include as much unnamed load in the late 1980's;

3. Critical Industries Act (Bill 31) now contains Newmont Mines through 1989/90 with only minor other changes;

4. Large Electric Boilers is a proposed new program for non-gas areas that would replace oil-fired boilers with electric boilers in the 5 to 50 megawatts range. To make the program attractive an initial firm period of supply is proposed. After this initial period the rate would likely become interruptible;

5. Security Lighting involves the promotion of energy efficient security lighting;

6. Surplus Energy Discount Rate to General Customers involves an interruptible rate for general service customers in non-gas areas who purchase additional electrical equipment (such as electric boilers, large electric furnaces, infra-red heaters, heat pumps for lumber drying and aquaculture);

7. Dual-Fuel Interruptible Space Heating involves an interruptible rate for customers in non-gas areas who install electric heating while maintaining their existing (oil or propane) system. Both residential and commercial customers could be eligible.

Table 10

REVISIONS TO 1986 ELECTRIC FORECAST - FOR REVENUE CALCULATIONS

January 1987

(Sales in GWh)

	FISCAL YEAR									
	1987/88		1988/89		1989/90		1990/91		1991/92	
	1986 F'cast	Jan. 1987 Rev'n	1986 F'cast	Jan. 1987 Rev'n	1986 F'cast	Jan. 1987 Rev'n	1986 F'cast	Jan. 1987 Rev'n	1986 F'cast	Jan. 1987 Rev'n
WKP&L	-	109	-	232	-	305	-	351	-	420
TRANSMISSION RATE	11315	11045	11660	11390	11940	11670	12355	12355	13015	13015
DOMESTIC MARKETING										
-Turbine Turndown (Rate 1844)	-	500	-	500	-	-	-	-	-	-
-Electric Discount Act (Rate 1845)	430	400	433	400	600	400	615	300	445	200
-Critical Industries Act (Bill 31)	400	653	285	493	60	312	45	97	-	-
-Large Electric Boilers	-	-	-	250	-	500	-	500	-	500
-Security Lighting	-	4	-	12	-	15	-	15	-	15
-Surplus Energy Discount Rate to General Customers	-	100	-	250	-	500	-	650	-	800
-Dual-Fuel Interruptible Space Heating	-	88	-	311	-	553	-	790	-	981
-Total Marketing	830	1745	718	2216	660	2280	660	2352	445	2496